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- GERLICH, D. Ion Trap Studies of Association Processes in Collisions of CH $_3^+$  and CD $_3^+$  with n-H $_2$ , p-H $_2$ , D $_2$ , and He at 80 K. *D. Gerlich and G. Kaefer*. 347, 849, 193-G13 (1989)
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- GILROY, KALPANA KRISHNASWAMY. Carbon Isotope Ratios and Lithium Abundances in Open Cluster Giants. *Kalpana Krishnaswamy Gilroy*. 347, 835, 193-F9 (1989)
- GIOIA, I. M. Radio Emission and the Hot Interstellar Medium of Early-Type Galaxies. *G. Fabbiano, I. M. Gioia, and G. Trinchieri*. 347, 127, 182-F3 (1989)
- GLACCUM, W. Far-Infrared Spectrophotometry of SN 1987A: Days 265 and 267. *S. H. Moseley, E. Dwek, W. Glaccum, J. R. Graham, R. F. Loewenstein, and R. F. Silverberg*. 347, 1119, 197-E1 (1989)
- GOODE, PHILIP R. The Toroidal Magnetic Field inside the Sun. *W. A. Dziembowski and Philip R. Goode*. 347, 540, 188-F1 (1989)
- GOPALSWAMY, N. The Radio Signatures of a Slow Coronal Mass Ejection: Electron Acceleration at Slow-Mode Shocks? *M. Kundu, N. Gopalswamy, S. White, P. Cargill, E. J. Schmahl, and E. Hildner*. 347, 505, 188-C3 (1989)
- GÓRSKI, KRZYZTOF M. Can a Thick Accretion Disk Lose Its Angular Momentum to Gravitational Radiation? *W. H. Zurek and Krzysztof M. Górski*. 347, L17, 189-C5 (1989)
- GOSS, W. M. The Structure of the Interstellar Medium at the 25 AU Scale. *P. J. Diamond, W. M. Goss, J. D. Romney, R. S. Booth, P. M. W. Kalberla, and U. Mebold*. 347, 302, 185-G3 (1989)
- Structure of the Magnetic Field in the W3 Core. *T. H. Troland, R. M. Crutcher, W. M. Goss, and C. Heiles*. 347, L89, 199-E5 (1989)
- GRAHAM, J. R. Far-Infrared Spectrophotometry of SN 1987A: Days 265 and 267. *S. H. Moseley, E. Dwek, W. Glaccum, J. R. Graham, R. F. Loewenstein, and R. F. Silverberg*. 347, 1119, 197-E1 (1989)
- GRAY, DAVID F. The Rotational Break for G Giants. *David F. Gray*. 347, 1021, 196-C1 (1989)
- GREDEL, R. Cosmic-Ray-induced Photodissociation and Photoionization Rates of Interstellar Molecules. *R. Gredel, S. Lepp, A. Dalgarno, and E. Herbst*. 347, 289, 185-F1 (1989)
- GREEN, RICHARD. Absorption Lines at  $z > 2.3$  in Spectra of Quasistellar Objects. *Pushpa Khare, Donald G. York, and Richard Green*. 347, 627, 191-A7 (1989)
- GRENIER, I. A. CO Observations of the Cepheus Flare. I. Molecular Clouds Associated with a Nearby Bubble. *I. A. Grenier, F. Lebrun, M. Arnaud, T. M. Dame, and P. Thaddeus*. 347, 231, 185-A1 (1989)
- HAN, MINGSHENG. Nonlinearity of the Tully-Fisher Relation. *Jeremy Mould, Mingsheng Han, and Greg Bothun*. 347, 112, 182-E1 (1989)
- HARDING, ALICE K. Nonthermal Synchrotron Radiation and Pair Annihilation in Gamma-Ray Bursts. *Robert D. Preece and Alice K. Harding*. 347, 1128, 197-E13 (1989)
- HARTIGAN, PATRICK. Molecular Hydrogen and Optical Images of HH 7-11. *Patrick Hartigan, Salvador Curiel, and John Raymond*. 347, L31, 189-D9 (1989)
- HARWIT, MARTIN. What is the Evidence on Antigalaxies? *Martin Harwit*. 347, 688, 191-G1 (1989)
- HASEGAWA, TETSUO. Aperture Synthesis Observations of the Molecular Environment of the Sgr A Complex. I. The M - 0.13 - 0.08 Molecular Cloud. *Sachiko K. Okumura, Masato Ishiguro, Edward B. Fomalont, Yoshihiro Chikada, Takashi Kasuga, Koh-ichiro Morita, Ryohei Kawabe, Hideyuki Kobayashi, Tomio Kanzawa, Hiroyuki Iwashita, and Tetsuo Hasegawa*. 347, 240, 185-A10 (1989)
- The Inner, Dense Part of the Protostellar Disk: A CS J = 7-6 Observation around NGC 2071 IRS. *Takuya Yamashita, Saeko S. Hayashi, Norio Kaifu, Osamu Kameya, Nobuharu Ukita, and Tetsuo Hasegawa*. 347, L85, 199-E1 (1989)
- HAYASHI, SAEKO S. The Inner, Dense Part of the Protostellar Disk: A CS J = 7-6 Observation around NGC 2071 IRS. *Takuya Yamashita, Saeko S. Hayashi, Norio Kaifu, Osamu Kameya, Nobuharu Ukita, and Tetsuo Hasegawa*. 347, L85, 199-E1 (1989)
- HAYASHIDA, K. X-Ray Outburst of the quasar 3C 279. *F. Makino, T. Kii, K. Hayashida, H. Inoue, Y. Tanaka, T. Ohashi, K. Makishima, H. Awaki, K. Koyama, M. J. L. Turner, and O. R. Williams*. 347, L9, 189-B9 (1989)



- HEAP, S. R. The Ultraviolet Variability of HD 45166 (qWR + B8 V): Evidence for Stellar Wind Radiative Instabilities. *Allan J. Willis, Ian D. Howarth, D. J. Strickland, and S. R. Heap.* **347**, 413, 187-C1 (1989)
- HECKMAN, TIMOTHY M. Long-Slit Optical Spectroscopy of Powerful Far-Infrared Galaxies: The Nature of the Nuclear Energy Source. *Lee Armus, Timothy M. Heckman, and George K. Miley.* **347**, 727, 192-D1 (1989)
- HEILES, C. Structure of the Magnetic Field in the W3 Core. *T. H. Troland, R. M. Crutcher, W. M. Goss, and C. Heiles.* **347**, L89, 199-E5 (1989)
- HEISLER, JULIA. Superclustering of Quasi-stellar Object Absorption Clouds. *Julia Heisler, Craig J. Hogan, and Simon D. M. White.* **347**, 52, 182-F7 (1989)
- HENNESSY, G. S. Faraday Rotation from Abell Clusters of Galaxies. *G. S. Hennessy, F. N. Owen, and J. A. Eilek.* **347**, 144, 184-A1 (1989)
- HENNING, P. A. A Small Spiral Galaxy Discovered at 21 Centimeters in a Cosmic Void. *P. A. Henning and F. J. Kerr.* **347**, L1, 189-B1 (1989)
- HENRY, GEORGE W. Chromospheric Ca II H and K and H $\alpha$  Emission in Single and Binary Stars of Spectral Types F6-M2 (Abstract of Paper in 1990 January Suppl.). *Klaus G. Strassmeier, Francis C. Fekel, Bernard W. Bopp, Robert C. Dempsey, and George W. Henry.* **347**, 1189, 198-E3 (1989)
- HERBST, E. Cosmic-Ray-induced Photodissociation and Photoionization Rates of Interstellar Molecules. *R. Gredel, S. Lepp, A. Dalgarno, and E. Herbst.* **347**, 289, 185-F1 (1989)
- HEYVAERTS, JEAN. The Collimation of Magnetized Winds. *Jean Heyvaerts and Colin Norman.* **347**, 1055, 196-F1 (1989)
- HILDNER, E. The Radio Signatures of a Slow Coronal Mass Ejection: Electron Acceleration at Slow-Mode Shocks? *M. Kundu, N. Gopalswamy, S. White, P. Cargill, E. J. Schmahl, and E. Hildner.* **347**, 505, 188-C3 (1989)
- HILLIER, D. J. WC Stars: Hot Stars with Cold Winds. *D. J. Hillier.* **347**, 392, 187-A1 (1989)
- HINES, DEAN C. Filaments in the Radio Lobes of M87. *Dean C. Hines, Frazer N. Owen, and Jean A. Eilek.* **347**, 713, 192-B11 (1989)
- HO, P. T. P. NH $_3$  Observations of Compressed Postshock Molecular Gas in Ionization-Shock Fronts around W33. *E. R. Keto and P. T. P. Ho.* **347**, 349, 186-D3 (1989)
- HO, PAUL T. P. Far-Infrared and Radio Observations of the W31 Star-forming Region. *S. K. Ghosh, K. V. K. Iyengar, T. N. Rengarajan, S. N. Tandon, R. P. Verma, R. R. Daniel, and Paul T. P. Ho.* **347**, 338, 186-C3 (1989)
- HOBBS, L. M. On Lithium Removal from G Dwarfs. *L. M. Hobbs, Icko Iben, Jr., and Catherine Pilachowski.* **347**, 817, 193-E1 (1989)
- HODGE, P. W. Oxygen Abundances in Nearby Dwarf Irregular Galaxies. *Evan D. Skillman, R. C. Kennicutt, and P. W. Hodge.* **347**, 875, 194-C11 (1989)
- HOGAN, CRAIG J. Superclustering of Quasi-stellar Object Absorption Clouds. *Julia Heisler, Craig J. Hogan, and Simon D. M. White.* **347**, 52, 182-F7 (1989)
- HOULAHAN, PADRAIG. Recognition and Characterization of Hierarchical Interstellar Structure. I. Correlation Function (Abstract of Paper in 1990 January Suppl.). *Padraig Houlahan and John Scalo.* **347**, 1188, 198-E2 (1989)
- HOUGAN, KERRY. Orbital Migration of Protoplanets: The Inertial Limit. *William R. Ward and Kerry Hourigan.* **347**, 490, 188-B1 (1989)
- HOWARTH, IAN D. The Ultraviolet Variability of HD 45166 (qWR + B8 V): Evidence for Stellar Wind Radiative Instabilities. *Allan J. Willis, Ian D. Howarth, D. J. Strickland, and S. R. Heap.* **347**, 413, 187-C1 (1989)
- HUGHES, V. A. CO J = 2-1 Observations of the NGC 2071 Molecular Outflow: A Wind-driven Shell. *G. H. Moriarty-Schieven, R. L. Snell, and V. A. Hughes.* **347**, 358, 186-E1 (1989)
- HUI, X. Maximum Entropy Deconvolution of the Optical Jet of 3C 273. *I. N. Evans, H. C. Ford, and X. Hui.* **347**, 68, 183-A1 (1989)
- IBEN, ICKO, JR. On Lithium Removal from G Dwarfs. *L. M. Hobbs, Icko Iben, Jr., and Catherine Pilachowski.* **347**, 817, 193-E1 (1989)
- On the Origin of Hot Subdwarfs in Globular Clusters. *Charles D. Bailyn and Icko Iben, Jr.* **347**, L21, 189-C9 (1989)
- IMPEY, C. D. The Miniblastar in 3C 273. *C. D. Impey, M. A. Malkan, and S. Tapia.* **347**, 96, 183-C9 (1989)
- INOUE, H. X-Ray Outburst of the quasar 3C 279. *F. Makino, T. Kii, K. Hayashida, H. Inoue, Y. Tanaka, T. Ohashi, K. Makishima, H. Awaki, K. Koyama, M. J. L. Turner, and O. R. Williams.* **347**, L9, 189-B9 (1989)
- ISHIGURO, MASATO. Aperture Synthesis Observations of the Molecular Environment of the Sgr A Complex. I. The M - 0.13 - 0.08 Molecular Cloud. *Sachiko K. Okumura, Masato Ishiguro, Edward B. Fomalont, Yoshihiro Chikada, Takashi Kasuga, Koh-ichiro Morita, Ryohei Kawabe, Hideyuki Kobayashi, Tomio Kanzawa, Hiroyuki Iwashita, and Tetsuo Hasegawa.* **347**, 240, 185-A10 (1989)
- ISHIGURO, MASATO. Aperture Synthesis Observations of the Molecular Environment of the Sgr A Complex. I. The M - 0.13 - 0.08 Molecular Cloud. *Sachiko K. Okumura, Masato Ishiguro, Edward B. Fomalont, Yoshihiro Chikada, Takashi Kasuga, Koh-ichiro Morita, Ryohei Kawabe, Hideyuki Kobayashi, Tomio Kanzawa, Hiroyuki Iwashita, and Tetsuo Hasegawa.* **347**, 240, 185-A10 (1989)
- IYENGAR, K. V. K. Far-Infrared and Radio Observations of the W31 Star-forming Region. *S. K. Ghosh, K. V. K. Iyengar, T. N. Rengarajan, S. N. Tandon, R. P. Verma, R. R. Daniel, and Paul T. P. Ho.* **347**, 338, 186-C3 (1989)
- JOHNSTON, K. J. The Distribution and Kinematics of Ammonia in the Orion-KL Nebula: High-Sensitivity VLA Maps of the NH $_3$ (3,2) Line. *V. Migenes, K. J. Johnston, T. A. Pauls, and T. L. Wilson.* **347**, 294, 185-F8 (1989)
- JOSEPH, CHARLES L. Predicting Peculiar Interstellar Extinction from Gaseous Abundances: Erratum. *Charles L. Joseph, Theodore P. Snow, Jr., and C. Gregory Seab.* **347**, 561, 188-G12 (1989) (Orig. paper in **340**, 314, 71-A1)
- JUNKKARINEN, VESA T. Variability of the Broad Absorption Lines in the QSO UM 232. *Thomas A. Barlow, Vesa T. Junkkarinen, and E. Margaret Burbidge.* **347**, 674, 191-E7 (1989)
- JUSZKIEWICZ, R. The Masses of Rich Clusters of Galaxies as a Test of the Biased Cold Dark Matter Theory. *P. J. E. Peebles, R. A. Daly, and R. Juszkiewicz.* **347**, 563, 190-C1 (1989)
- KAEFER, G. Ion Trap Studies of Association Processes in Collisions of CH $_3^+$  and CD $_3^+$  with n-H $_2$ , p-H $_2$ , D $_2$ , and He at 80 K. *D. Gerlich and G. Kaefler.* **347**, 849, 193-G13 (1989)
- KAIFU, NORIO. A New CO Bipolar Flow and Dense Disk System Associated with the Infrared Reflection Nebula GGD 27 IRS. *Takuya Yamashita, Hiroko Suzuki, Norio Kaifu, Motohide Tamura, Charles M. Mountain, and Toby J. T. Moore.* **347**, 894, 194-E7 (1989)
- The Inner, Dense Part of the Protostellar Disk: A CS J = 7-6 Observation around NGC 2071 IRS. *Takuya Yamashita, Saeko S. Hayashi, Norio Kaifu, Osamu Kameya, Nobuharu Ukita, and Tetsuo Hasegawa.* **347**, L85, 199-E1 (1989)
- KALBERLA, P. M. W. The Structure of the Interstellar Medium at the 25 AU Scale. *P. J. Diamond, W. M. Goss, J. D. Romney, R. S. Booth, P. M. W. Kalberla, and U. Mebold.* **347**, 302, 185-G3 (1989)
- KAMEYA, OSAMU. The Inner, Dense Part of the Protostellar Disk: A CS J = 7-6 Observation around NGC 2071 IRS. *Takuya Yamashita, Saeko S. Hayashi, Norio Kaifu, Osamu Kameya, Nobuharu Ukita, and Tetsuo Hasegawa.* **347**, L85, 199-E1 (1989)
- KANZAWA, TOMIO. Aperture Synthesis Observations of the Molecular Environment of the Sgr A Complex. I. The M - 0.13 - 0.08 Molecular Cloud. *Sachiko K. Okumura, Masato Ishiguro, Edward B. Fomalont, Yoshihiro Chikada, Takashi Kasuga, Koh-ichiro Morita, Ryohei Kawabe, Hideyuki Kobayashi, Tomio Kanzawa, Hiroyuki Iwashita, and Tetsuo Hasegawa.* **347**, 240, 185-A10 (1989)
- KASSIM, NAMIR E. Low-Frequency Observations of Galactic Supernova Remnants and the Distribution of Low-Density Ionized Gas in the Interstellar Medium. *Namir E. Kassim.* **347**, 915, 194-G9 (1989)
- KASUGA, TAKASHI. Aperture Synthesis Observations of the Molecular Environment of the Sgr A Complex. I. The M - 0.13 - 0.08 Molecular Cloud. *Sachiko K. Okumura, Masato Ishiguro, Edward B. Fomalont, Yoshihiro Chikada, Takashi Kasuga, Koh-ichiro Morita, Ryohei Kawabe, Hideyuki Kobayashi, Tomio Kanzawa, Hiroyuki Iwashita, and Tetsuo Hasegawa.* **347**, 240, 185-A10 (1989)
- KAWABE, RYOHEI. Aperture Synthesis Observations of the Molecular Environment of the Sgr A Complex. I. The M - 0.13 - 0.08 Molecular Cloud. *Sachiko K. Okumura, Masato Ishiguro, Edward B. Fomalont, Yoshihiro Chikada, Takashi Kasuga, Koh-ichiro Morita, Ryohei Kawabe, Hideyuki Kobayashi, Tomio Kanzawa, Hiroyuki Iwashita, and Tetsuo Hasegawa.* **347**, 240, 185-A10 (1989)
- KAZANAS, DEMOSTHENES. On the Nature of Emission-Line Clouds of Quasars and Active Galactic Nuclei. *Demosthenes Kazanas.* **347**, 74, 183-A11 (1989)
- KENNICUTT, R. C. Oxygen Abundances in Nearby Dwarf Irregular Galaxies. *Evan D. Skillman, R. C. Kennicutt, and P. W. Hodge.* **347**, 875, 194-C11 (1989)
- KERR, F. J. A Small Spiral Galaxy Discovered at 21 Centimeters in a Cosmic Void. *P. A. Henning and F. J. Kerr.* **347**, L1, 189-B1 (1989)
- KETO, E. R. NH $_3$  Observations of Compressed Postshock Molecular Gas in Ionization-Shock Fronts around W33. *E. R. Keto and P. T. P. Ho.* **347**, 349, 186-D3 (1989)
- KHARE, PUSHPA. Absorption Lines at  $z > 2.3$  in Spectra of Quasi-stellar Objects. *Pushpa Khare, Donald G. York, and Richard Green.* **347**, 627, 191-A7 (1989)

- KII, T. X-Ray Outburst of the quasar 3C 279. *F. Makino, T. Kii, K. Hayashida, H. Inoue, Y. Tanaka, T. Ohashi, K. Makishima, H. Awaki, K. Koyama, M. J. L. Turner, and O. R. Williams.* 347, L9, 189-B9 (1989)
- KIRSHNER, ROBERT P. Model Atmospheres for SN 1987A and the Distance to the Large Magellanic Cloud. *Ronald G. Eastman and Robert P. Kirshner.* 347, 771, 193-A3 (1989)
- An Atlas of Confirmed and Candidate Supernova Remnants in M33 (Abstract of Paper in 1990 January Suppl.). *Knox S. Long, William P. Blair, Robert P. Kirshner, and P. Frank Winkler.* 347, 1188, 198-E2 (1989)
- KNAPP, G. R. A Study of OH/IR Stars and Planetary Nebula Formation. *P. F. Bowers and G. R. Knapp.* 347, 325, 186-B1 (1989)
- KNEZEK, PATRICIA M. The Ratio of Molecular to Atomic Gas in Spiral Galaxies as a Function of Morphological Type. *Judith S. Young and Patricia M. Knezek.* 347, L55, 199-A9 (1989)
- KOBAYASHI, HIDEYUKI. Aperture Synthesis Observations of the Molecular Environment of the Sgr A Complex. I. The M - 0.13 - 0.08 Molecular Cloud. *Sachiko K. Okumura, Masato Ishiguro, Edward B. Fomalont, Yoshihiro Chikada, Takashi Kasuga, Koh-ichi Morita, Ryohi Kawabe, Hideyuki Kobayashi, Tomio Kanazawa, Hiroyuki Iwashita, and Tetsuo Hasegawa.* 347, 240, 185-A10 (1989)
- KONDO, YOJI. Analysis of the Velocity Law in the Wind of the Be Star  $\lambda$  Pavonis. *Haigi Chen, Adela Ringuelet, Jorge Sahade, and Yoji Kondo.* 347, 1082, 197-A1 (1989)
- KOYAMA, K. X-Ray Outburst of the quasar 3C 279. *F. Makino, T. Kii, K. Hayashida, H. Inoue, Y. Tanaka, T. Ohashi, K. Makishima, H. Awaki, K. Koyama, M. J. L. Turner, and O. R. Williams.* 347, L9, 189-B9 (1989)
- KROLIK, JULIAN H. The Physical State of the Obscuring Torus in Seyfert Galaxies. *Julian H. Krolik and Stephen Lepp.* 347, 179, 184-C10 (1989)
- KUNDU, M. The Radio Signatures of a Slow Coronal Mass Ejection: Electron Acceleration at Slow-Mode Shocks? *M. Kundu, N. Gopalswamy, S. White, P. Cargill, E. J. Schmahl, and E. Hildner.* 347, 505, 188-C3 (1989)
- KUNKEL, WILLIAM E. Light Echoes and Transient Luminescence near SN 1987A. *Arlin P. S. Crots, William E. Kunkel, and Patrick J. McCarthy.* 347, L61, 199-B5 (1989)
- LAMERS, HENNY J. G. L. M. Grain Ultraviolet Extinction Properties of Recently Discovered Post-Asymptotic Giant Branch Stars. *Richard H. Buss, Jr., Henny J. G. L. M. Lamers, and Theodore P. Snow, Jr.* 347, 977, 195-F3 (1989)
- LATTANZIO, JOHN C. Photofission Production of Technetium and Synthetic Asymptotic Giant Branch Evolution. *John C. Lattanzio and Robert A. Malaney.* 347, 989, 195-G3 (1989)
- LAUER, TOD R. Core Expansion in Young Clusters in the Large Magellanic Cloud. *Rebecca A. W. Elton, Kenneth C. Freeman, and Tod R. Lauer.* 347, L69, 199-C9 (1989)
- LEBRUN, F. CO Observations of the Cepheus Flare. I. Molecular Clouds Associated with a Nearby Bubble. *I. A. Grenier, F. Lebrun, M. Arnaud, T. M. Dame, and P. Thaddeus.* 347, 231, 185-A1 (1989)
- LEPP, S. Cosmic-Ray-induced Photodissociation and Photoionization Rates of Interstellar Molecules. *R. Gredel, S. Lepp, A. Dalgarno, and E. Herbst.* 347, 289, 185-F1 (1989)
- LEPP, STEPHEN. The Physical State of the Obscuring Torus in Seyfert Galaxies. *Julian H. Krolik and Stephen Lepp.* 347, 179, 184-C10 (1989)
- LIEBERT, JAMES. The Nebula around EGB 6/PG 0950 + 139: Evidence for Ablation of a Jovian Planet? *Michael A. Dopita and James Liebert.* 347, 910, 194-G1 (1989)
- LOEWENSTEIN, R. F. Far-Infrared Spectrophotometry of SN 1987A: Days 265 and 267. *S. H. Moseley, E. Dwek, W. Glaccum, J. R. Graham, R. F. Loewenstein, and R. F. Silberg.* 347, 1119, 197-E1 (1989)
- LOMINADZE, J. B. Fast Variation of Cygnus X-1 and Related Sources. *G. D. Chagelishvili, J. B. Lominadze, and A. D. Rogava.* 347, 1100, 197-C1 (1989)
- LONG, KNOX S. An Atlas of Confirmed and Candidate Supernova Remnants in M33 (Abstract of Paper in 1990 January Suppl.). *Knox S. Long, William P. Blair, Robert P. Kirshner, and P. Frank Winkler.* 347, 1188, 198-E2 (1989)
- LOOMIS, CHARLES G. HR Aurigae: An Active Binary? *Charles G. Loomis and Edward G. Schmidt.* 347, L77, 199-D5 (1989)
- LOU, YU-QING. The Onset of Magnetohydrodynamic Convective Instability. I. Ideal Limit. *Yu-Qing Lou.* 347, 520, 188-D7 (1989)
- LUPTON, ROBERT H. The Internal Velocity Dispersions of Three Young Star Clusters in the Large Magellanic Cloud. *Robert H. Lupton, S. Michael Fall, Kenneth C. Freeman, and Rebecca A. W. Elton.* 347, 201, 184-E8 (1989)
- MACCHETTO, DUCCIO. Polarization and Visual Intensity of the Inner Light Echo around SN 1987A. *William B. Sparks, Francesco Paresce, and Duccio Macchetto.* 347, L65, 199-C2 (1989)
- MACFARLANE, JOSEPH J. Shock-generated X-Ray Emission in Radiatively Driven Winds: A Model for Tau Scorpii. *Joseph J. MacFarlane and Joseph P. Cassinelli.* 347, 1090, 197-A13 (1989)
- MAJEWSKI, W. A. Laboratory Observation of the  $2p_2$  Band of the  $H_2^+$  Molecular Ion. *W. A. Majewski, P. A. Feldman, and J. K. G. Watson.* 347, L51, 189-F5 (1989)
- MAKINO, F. X-Ray Outburst of the quasar 3C 279. *F. Makino, T. Kii, K. Hayashida, H. Inoue, Y. Tanaka, T. Ohashi, K. Makishima, H. Awaki, K. Koyama, M. J. L. Turner, and O. R. Williams.* 347, L9, 189-B9 (1989)
- MAKISHIMA, K. X-Ray Outburst of the quasar 3C 279. *F. Makino, T. Kii, K. Hayashida, H. Inoue, Y. Tanaka, T. Ohashi, K. Makishima, H. Awaki, K. Koyama, M. J. L. Turner, and O. R. Williams.* 347, L9, 189-B9 (1989)
- MALANEY, ROBERT A. Photofission Production of Technetium and Synthetic Asymptotic Giant Branch Evolution. *John C. Lattanzio and Robert A. Malaney.* 347, 989, 195-G3 (1989)
- MALIN, DAVID F. The Extended Red Emission Filaments in NGC 2023. *Adolf N. Witt and David F. Malin.* 347, L25, 189-D1 (1989)
- MALKAN, M. A. The Miniblastar in 3C 273. *C. D. Impey, M. A. Malkan, and S. Tapia.* 347, 96, 183-C9 (1989)
- MARGON, BRUCE. Ten Years of SS 433 Kinematics. *Bruce Margon and Scott F. Anderson.* 347, 448, 187-E11 (1989)
- MARTINEZ-GONZALES, E. Large-Scale Streaming Motions and Microwave Background Anisotropies. *E. Martinez-Gonzales and J. L. Sanz.* 347, 11, 182-C1 (1989)
- MASSA, DERCK. An Analysis of the Shapes of Ultraviolet Extinction Curves. III. An Atlas of Ultraviolet Extinction Curves (Abstract of Paper in 1990 January Suppl.). *Edward L. Fitzpatrick and Derck Massa.* 347, 1189, 198-E3 (1989)
- MASSARO, E. Small-Amplitude Coherent Signals in the X-Ray Emission of NGC 4151. *F. Fiore, E. Massaro, G. C. Perola, and L. Piro.* 347, 171, 183-C1 (1989)
- MATTHEWS, K. Continuum Energy Distributions of Quasars: Shapes and Origins. *D. B. Sanders, E. S. Phinney, G. Neugebauer, B. T. Saifer, and K. Matthews.* 347, 29, 182-D7 (1989)
- MAYR, HANS G. Do Faculae Blanket Sunspots? *Kenneth H. Schatten, Jerry Oroz, and Hans G. Mayr.* 347, 514, 188-D1 (1989)
- MAZZITELLI, I. The Fastest Evolving White Dwarfs. *F. D'Antona and I. Mazzitelli.* 347, 934, 195-B7 (1989)
- MCCARTHY, PATRICK J. Light Echoes and Transient Luminescence near SN 1987A. *Arlin P. S. Crots, William E. Kunkel, and Patrick J. McCarthy.* 347, L61, 199-B5 (1989)
- MCCLUKE, R. D. The Intrinsic Frequency of Faint Supernovae Resembling SN 1987A. *Sidney van den Bergh and R. D. McClure.* 347, L29, 189-D7 (1989)
- MCCLYMONT, ALEXANDER N. Can Cool Loop Flows Explain "Transition Region" Redshifts? *Alexander N. McClymont.* 347, L47, 189-F1 (1989)
- MEBOLD, U. The Structure of the Interstellar Medium at the 25 AU Scale. *P. J. Diamond, W. M. Goss, J. D. Romney, R. S. Booth, P. M. W. Kalberla, and U. Mebold.* 347, 302, 185-G3 (1989)
- MEERSON, B. The Nonlinear Theory of Thermal Instability: The Intermediate- and Short-Wavelength Limits. *B. Meerson.* 347, 1012, 196-B3 (1989)
- MÉSZÁROS, P. Self-consistent Spherical Accretion Shocks around Black Holes. *Arif Babul, Jeremiah P. Ostriker, and P. Mészáros.* 347, 59, 182-G1 (1989)
- MICHAUD, GEORGES. Lithium Abundance in Cluster Giants: Constraints on Meridional Circulation Transport on the Main Sequence. *Paul Charbonneau, Georges Michaud, and Charles R. Proffitt.* 347, 821, 193-E7 (1989)
- MIGENES, V. The Distribution and Kinematics of Ammonia in the Orion-KL Nebula: High-Sensitivity VLA Maps of the  $NH_3(3,2)$  Line. *V. Migenes, K. J. Johnston, T. A. Pauls, and T. L. Wilson.* 347, 294, 185-F8 (1989)
- MILEY, GEORGE K. Long-Slit Optical Spectroscopy of Powerful Far-Infrared Galaxies: The Nature of the Nuclear Energy Source. *Lee Armus, Timothy M. Heckman, and George K. Miley.* 347, 727, 192-D1 (1989)
- MILLIS, ROBERT L. The Nucleus of Comet P/Tempel 2. *Michael F. A'Hearn, Humberto Campins, David G. Schleicher, and Robert L. Millis.* 347, 1155, 198-A4 (1989)
- MOFFAT, ANTHONY F. J. Wolf-Rayet Stars in the Magellanic Clouds. VII. Spectroscopic Binary Search among the WNL Stars and the WN6/7-WN8/9 Dichotomy. *Anthony F. J. Moffat.* 347, 373, 186-F5 (1989)
- Polarization Variability among Wolf-Rayet Stars. V. Linear Polarization of the Bright Cygnus Stars and an Anticorrelation of Variability

- with Wind Speed. *Carmelle Robert, Anthony F. J. Moffat, Pierre Bastien, Laurent Drissen, and Nicole St-Louis.* 347, 1034, 196-D5 (1989)
- MOFFAT, J. W. The Newly Detected Pulsar in SN 1987A as a Test of Gravitational Theories. *J. W. Moffat.* 347, L59, 199-B1 (1989)
- MOLTENI, D. The X-Ray Structure of Centaurus A from 0.1 to 50 keV Observations with EXOSAT. *M. Morini, F. Anselmo, and D. Molteni.* 347, 750, 192-F3 (1989)
- MOORE, DAVID J. Ly $\alpha$  Emission from Disk Absorption Systems at High Redshift: Star Formation in Young Galaxy Disks. *Harding E. Smith, Ross D. Cohen, Joseph E. Burns, David J. Moore, and Barbara A. Uchida.* 347, 87, 183-B11 (1989)
- MOORE, TOBY J. T. A New CO Bipolar Flow and Dense Disk System Associated with the Infrared Reflection Nebula GGD 27 IRS. *Takuya Yamashita, Hiroko Suzuki, Norio Kaifu, Motohide Tamura, Charles M. Mountain, and Toby J. T. Moore.* 347, 894, 194-E7 (1989)
- MORIARTY-SCHIEVEN, G. H. CO J = 2-1 Observations of the NGC 2071 Molecular Outflow: A Wind-driven Shell. *G. H. Moriarty-Schieven, R. L. Snell, and V. A. Hughes.* 347, 358, 186-E1 (1989)
- MORINI, M. The X-Ray Structure of Centaurus A from 0.1 to 50 keV Observations with EXOSAT. *M. Morini, F. Anselmo, and D. Molteni.* 347, 750, 192-F3 (1989)
- MORITA, KOH-ICHIRO. Aperture Synthesis Observations of the Molecular Environment of the Sgr A Complex. I. The M - 0.13 - 0.08 Molecular Cloud. *Sachiko K. Okumura, Masato Ishiguro, Edward B. Fomalont, Yoshihiro Chikada, Takashi Kasuga, Koh-ichiro Morita, Ryohei Kawabe, Hideyuki Kobayashi, Tomio Kanzawa, Hiroyuki Iwashita, and Tetsuo Hasegawa.* 347, 240, 185-A10 (1989)
- MOSELEY, S. H. Far-Infrared Spectrophotometry of SN 1987A: Days 265 and 267. *S. H. Moseley, E. Dwek, W. Glaccum, J. R. Graham, R. F. Loewenstein, and R. F. Silverberg.* 347, 1119, 197-E1 (1989)
- MOULD, JEREMY. Nonlinearity of the Tully-Fisher Relation. *Jeremy Mould, Mingsheng Han, and Greg Bohun.* 347, 112, 182-E1 (1989)
- MOUNTAIN, CHARLES M. A New CO Bipolar Flow and Dense Disk System Associated with the Infrared Reflection Nebula GGD 27 IRS. *Takuya Yamashita, Hiroko Suzuki, Norio Kaifu, Motohide Tamura, Charles M. Mountain, and Toby J. T. Moore.* 347, 894, 194-E7 (1989)
- MYERS, P. C. Radio Continuum Observations of IRAS Sources Associated with Dense Cores. *L. F. Rodriguez, P. C. Myers, I. Cruz-González, and S. Terebey.* 347, 461, 187-F11 (1989)
- NASH, A. G. Evolution of the Sun's Polar Fields during Sunspot Cycle 21: Poleward Surges and Long-Term Behavior. *Y.-M. Wang, A. G. Nash, and N. R. Sheeley, Jr.* 347, 529, 188-E3 (1989)
- NETZER, HAGAI. Small Dense Broad-Line Regions in Active Nuclei. *M. J. Rees, Hagai Netzer, and G. J. Ferland.* 347, 640, 191-B11 (1989)
- NEUGEBAUER, G. Continuum Energy Distributions of Quasars: Shapes and Origins. *D. B. Sanders, E. S. Phinney, G. Neugebauer, B. T. Soifer, and K. Matthews.* 347, 29, 182-D7 (1989)
- NORMAN, COLIN. The Collimation of Magnetized Winds. *Jean Heyvaerts and Colin Norman.* 347, 1055, 196-F1 (1989)
- NOUSEK, J. A. Search for Soft X-Ray Emission from SN 1987A with a CCD X-Ray Imaging Spectrometer. *D. N. Burrows, J. A. Nousek, G. D. Berthiaume, and G. P. Garmire.* 347, 1114, 197-D7 (1989)
- O'DONOGHUE, AILEEN. VLA Observations of Wide-Angle Tailed Radio Sources (Abstract of Paper in 1990 January Suppl.). *Aileen A. O'Donoghue, Frazer N. Owen, and Jean A. Eilek.* 347, 1188, 198-E2 (1989)
- OHASHI, T. X-Ray Outburst of the quasar 3C 279. *F. Makino, T. Kii, K. Hayashida, H. Inoue, Y. Tanaka, T. Ohashi, K. Makishima, H. Awaki, K. Koyama, M. J. L. Turner, and O. R. Williams.* 347, L9, 189-B9 (1989)
- OKE, J. B. The Helium Abundance in the Population II Cepheid, W Virginis. *Alex Raga, George Wallerstein, and J. B. Oke.* 347, 1107, 197-C11 (1989)
- OKUMURA, SACHIKO K. Aperture Synthesis Observations of the Molecular Environment of the Sgr A Complex. I. The M - 0.13 - 0.08 Molecular Cloud. *Sachiko K. Okumura, Masato Ishiguro, Edward B. Fomalont, Yoshihiro Chikada, Takashi Kasuga, Koh-ichiro Morita, Ryohei Kawabe, Hideyuki Kobayashi, Tomio Kanzawa, Hiroyuki Iwashita, and Tetsuo Hasegawa.* 347, 240, 185-A10 (1989)
- OROSZ, JERRY. Do Faculae Blanket Sunspots? *Kenneth H. Schatten, Jerry Orosz, and Hans G. Mayr.* 347, 514, 188-D1 (1989)
- OSTRIKER, JEREMIAH P. Self-consistent Spherical Accretion Shocks around Black Holes. *Arif Babul, Jeremiah P. Ostriker, and P. Mészáros.* 347, 59, 182-G1 (1989)
- Spherical Accretion onto Black Holes: A New, Higher Efficiency Type of Solution with Significant Pair Production. *Myeong-Gu Park and Jeremiah P. Ostriker.* 347, 679, 191-F1 (1989)
- OWEN, F. N. Faraday Rotation from Abell Clusters of Galaxies. *G. S. Hennessy, F. N. Owen, and J. A. Eilek.* 347, 144, 184-A1 (1989)
- OWEN, FRAZER N. Filaments in the Radio Lobes of M87. *Dean C. Hines, Frazer N. Owen, and Jean A. Eilek.* 347, 713, 192-B11 (1989)
- VLA Observations of Wide-Angle Tailed Radio Sources (Abstract of Paper in 1990 January Suppl.). *Aileen A. O'Donoghue, Frazer N. Owen, and Jean A. Eilek.* 347, 1188, 198-E2 (1989)
- PAPANASTASSIOU, D. A. Iron Isotope Anomalies. *J. Völkering and D. A. Papanastassiou.* 347, L43, 189-E10 (1989)
- PARENT, DENISE C. Reactions of C<sub>2</sub>N<sup>+</sup> with Methane and the Implications for Interstellar Chemistry. *Denise C. Parent.* 347, 1183, 198-C13 (1989)
- PARESC, FRANCESCO. Polarization and Visual Intensity of the Inner Light Echo around SN 1987A. *William B. Sparks, Francesco Paresce, and Duccio Macchetto.* 347, L65, 199-C2 (1989)
- PARK, MYEONG-GU. Spherical Accretion onto Black Holes: A New, Higher Efficiency Type of Solution with Significant Pair Production. *Myeong-Gu Park and Jeremiah P. Ostriker.* 347, 679, 191-F1 (1989)
- PARK, SEOK JAE. An Axisymmetric, Nonstationary Model of the Central Engine in an Active Galactic Nucleus. II. Accretion Disk Electrodynamics. *Seok Jae Park and Ethan T. Vishniac.* 347, 684, 191-F9 (1989)
- PARRAVANO, A. A Self-regulated Star Formation Rate as a Function of Global Galactic Parameters. *A. Parravano.* 347, 812, 193-D9 (1989)
- PASTORIZA, MIRAINI GRISELDA. On the Metal Abundance of Low-Activity Galactic Nuclei. *Thaisa Storchi Bergmann and Miraini Griselda Pastoriza.* 347, 195, 184-E1 (1989)
- PAULS, T. A. The Distribution and Kinematics of Ammonia in the Orion-KL Nebula: High-Sensitivity VLA Maps of the NH<sub>3</sub>(3,2) Line. *V. Migenes, K. J. Johnston, T. A. Pauls, and T. L. Wilson.* 347, 294, 185-F8 (1989)
- PEACOCK, A. EXOSAT Observations of the Kepler Supernova Remnant. *A. Smith, A. Peacock, M. Arnaud, J. Ballet, R. Rothenflug, and R. Rocchia.* 347, 925, 195-A9 (1989)
- PEEBLES, P. J. E. The Masses of Rich Clusters of Galaxies as a Test of the Biased Cold Dark Matter Theory. *P. J. E. Peebles, R. A. Daly, and R. Juszkiewicz.* 347, 563, 190-C1 (1989)
- PÉREZ-FOURNON, I. Optical Observations of Galaxies Containing Radio Jets: A Catalog of Sources with Redshift Smaller than 0.15 (Abstract of Paper in 1990 January Suppl.). *L. Colina and I. Pérez-Fournon.* 347, 1187, 198-E1 (1989)
- PEROLA, G. C. Small-Amplitude Coherent Signals in the X-Ray Emission of NGC 4151. *F. Fiore, E. Massaro, G. C. Perola, and L. Piro.* 347, 171, 183-C1 (1989)
- PERSSON, S. E. Implications of Ca II Emission for Physical Conditions in the Broad-Line Region of Active Galactic Nuclei. *G. J. Ferland and S. E. Persson.* 347, 656, 191-D1 (1989)
- PETERSON, RUTH C. The Nonthermal Stellar Dynamics of the Globular Cluster M15. *Ruth C. Peterson, Patrick Seitzer, and Kyle M. Cudworth.* 347, 251, 185-B8 (1989)
- Relative Abundance Determinations in Extremely Metal-poor Giants. I. Photometry and Equivalent Width Measurements. *Ruth C. Peterson and Bruce W. Carney.* 347, 266, 185-D1 (1989)
- PHINNEY, E. S. Continuum Energy Distributions of Quasars: Shapes and Origins. *D. B. Sanders, E. S. Phinney, G. Neugebauer, B. T. Soifer, and K. Matthews.* 347, 29, 182-D7 (1989)
- PILACHOWSKI, CATHERINE. On Lithium Removal from G Dwarfs. *L. M. Hobbs, Icko Iben, Jr., and Catherine Pilachowski.* 347, 817, 193-E1 (1989)
- PINEAULT, SERGE. Encounters between Degenerate Stars and Extrasolar Comet Clouds. *Serge Pineault and Eric Poisson.* 347, 1141, 197-G1 (1989)
- PINSONNEAULT, MARC H. The Ages of Globular Cluster Stars: Effects on Rotation of Pre-Main-Sequence, Main-Sequence, and Turnoff Evolution. *Constantine P. Deliyannis, Pierre Demarque, and Marc H. Pinsonneault.* 347, L73, 199-D1 (1989)
- PIRO, L. Small-Amplitude Coherent Signals in the X-Ray Emission of NGC 4151. *F. Fiore, E. Massaro, G. C. Perola, and L. Piro.* 347, 171, 183-C1 (1989)
- POISSON, ERIC. Encounters between Degenerate Stars and Extrasolar Comet Clouds. *Serge Pineault and Eric Poisson.* 347, 1141, 197-G1 (1989)
- POLLOCK, A. M. T. Comments on the Einstein X-Ray Variability of HD 50896 and Other Wolf-Rayet Stars. *A. M. T. Pollock.* 347, 409, 187-B6 (1989)
- PREECE, ROBERT D. Nonthermal Synchrotron Radiation and Pair Annihilation in Gamma-Ray Bursts. *Robert D. Preece and Alice K. Harding.* 347, 1128, 197-E13 (1989)



- PRESS, WILLIAM H. Dynamical Evolution of Domain Walls in an Expanding Universe. *William H. Press, Barbara S. Ryden, and David N. Spergel*. 347, 590, 190-E3 (1989)
- PRIEST, E. R. The Nonuniform Magnetohydrodynamic Nature of the Solar Corona. III. Cylindrical Geometry. *A. de Ville and E. R. Priest*. 347, 1167, 198-B5 (1989)
- PROFFITT, CHARLES R. Lithium Abundance in Cluster Giants: Constraints on Meridional Circulation Transport on the Main Sequence. *Paul Charbonneau, Georges Michaud, and Charles R. Proffitt*. 347, 821, 193-E7 (1989)
- RABY, STUART. Cosmions and the Stability of the Solar Core. *Stuart Raby*. 347, 551, 188-G1 (1989)
- RAGA, ALEX. The Helium Abundance in the Population II Cepheid, W Virginis. *Alex Raga, George Wallerstein, and J. B. Oke*. 347, 1107, 197-C11 (1989)
- RAYMOND, JOHN. Molecular Hydrogen and Optical Images of HH 7-11. *Patrick Hartigan, Salvador Curiel, and John Raymond*. 347, L31, 189-D9 (1989)
- REBOLO, R. Oxygen Abundances in Unevolved Metal-poor Stars: Interpretation and Consequences. *C. Abia and R. Rebolo*. 347, 186, 184-D5 (1989)
- REES, M. J. Small Dense Broad-Line Regions in Active Nuclei. *M. J. Rees, Hagai Netzer, and G. J. Ferland*. 347, 640, 191-B11 (1989)
- RENGARAJAN, T. N. Far-Infrared and Radio Observations of the W31 Star-forming Region. *S. K. Ghosh, K. V. K. Iyengar, T. N. Rengarajan, S. N. Tandon, R. P. Verma, R. R. Daniel, and Paul T. P. Ho*. 347, 338, 186-C3 (1989)
- RINGUELET, ADELA. Analysis of the Velocity Law in the Wind of the Be Star  $\lambda$  Pavonis. *Haigi Chen, Adela Ringuelet, Jorge Sahade, and Yoji Kondo*. 347, 1082, 197-A1 (1989)
- ROBERT, CARMELLE. Polarization Variability among Wolf-Rayet Stars. V. Linear Polarization of the Bright Cygnus Stars and an Anticorrelation of Variability with Wind Speed. *Carmelle Robert, Anthony F. J. Moffat, Pierre Bastien, Laurent Drissen, and Nicole St-Louis*. 347, 1034, 196-D5 (1989)
- ROBERTS, D. H. The Milliarcsecond Polarization Structure of Six BL Lacertae Objects. *D. C. Gabuzda, T. V. Cawthorne, D. H. Roberts, and J. F. C. Wardle*. 347, 701, 192-A5 (1989)
- ROCCHIA, R. EXOSAT Observations of the Kepler Supernova Remnant. *A. Smith, A. Peacock, M. Arnaud, J. Ballet, R. Rothenflug, and R. Rocchia*. 347, 925, 195-A9 (1989)
- RODRIGUEZ, L. F. Radio Continuum Observations of IRAS Sources Associated with Dense Cores. *L. F. Rodriguez, P. C. Myers, I. Cruz-Gonzalez, and S. Terebey*. 347, 461, 187-F11 (1989)
- ROGAVA, A. D. Fast Variation of Cygnus X-1 and Related Sources. *G. D. Chagelishvili, J. B. Lominadze, and A. D. Rogava*. 347, 1100, 197-C1 (1989)
- ROMANI, R. W. Evidence for Geodetic Spin Precession in the Binary Pulsar PSR 1913 + 16. *J. M. Weisberg, R. W. Romani, and J. H. Taylor*. 347, 1030, 196-C13 (1989)
- ROMNEY, J. D. The Structure of the Interstellar Medium at the 25 AU Scale. *P. J. Diamond, W. M. Goss, J. D. Romney, R. S. Booth, P. M. W. Kalberla, and U. Mebold*. 347, 302, 185-G3 (1989)
- ROTHENFLUG, R. EXOSAT Observations of the Kepler Supernova Remnant. *A. Smith, A. Peacock, M. Arnaud, J. Ballet, R. Rothenflug, and R. Rocchia*. 347, 925, 195-A9 (1989)
- RUDEN, STEVEN P. Eccentric Gravitational Instabilities in Nearly Keplerian Disks. *Fred C. Adams, Steven P. Ruden, and Frank H. Shu*. 347, 959, 195-D11 (1989)
- RYDEN, BARBARA S. Dynamical Evolution of Domain Walls in an Expanding Universe. *William H. Press, Barbara S. Ryden, and David N. Spergel*. 347, 590, 190-E3 (1989)
- SABBADIN, FRANCO. Padova 1: A Heavily Obscured Seyfert Galaxy in Aquila. *Franco Sabbadin, Enrico Cappellaro, Luciano Salvadori, and Massimo Turatto*. 347, L5, 189-B5 (1989)
- SAHADE, JORGE. An Interpretation of the Line Profile Variations in the IUE Spectrum of the Wolf-Rayet Binary  $\gamma_2$  Velorum: Erratum. *Estela Brandi, Osvaldo Ferrer, and Jorge Sahade*. 347, 561, 188-G12 (1989) (Orig. paper in 340, 1091, 81-G6)
- Analysis of the Velocity Law in the Wind of the Be Star  $\lambda$  Pavonis. *Haigi Chen, Adela Ringuelet, Jorge Sahade, and Yoji Kondo*. 347, 1082, 197-A1 (1989)
- SALVADORI, LUCIANO. Padova 1: A Heavily Obscured Seyfert Galaxy in Aquila. *Franco Sabbadin, Enrico Cappellaro, Luciano Salvadori, and Massimo Turatto*. 347, L5, 189-B5 (1989)
- SALZER, JOHN J. Observations of a Complete Sample of Emission-Line Galaxies. III. Spatial and Luminosity Distributions of the UM Galaxies. *John J. Salzer*. 347, 152, 184-A9 (1989)
- SANDERS, D. B. Continuum Energy Distributions of Quasars: Shapes and Origins. *D. B. Sanders, E. S. Phinney, G. Neugebauer, B. T. Soifer, and K. Matthews*. 347, 29, 182-D7 (1989)
- SANZ, J. L. Large-Scale Streaming Motions and Microwave Background Anisotropies. *E. Martinez-Gonzales and J. L. Sanz*. 347, 11, 182-C1 (1989)
- SCALO, JOHN. Recognition and Characterization of Hierarchical Interstellar Structure. I. Correlation Function (Abstract of Paper in 1990 January Suppl.). *Padraig Houlahan and John Scalo*. 347, 1188, 198-E2 (1989)
- SCHAEFER, ROBERT K. Large-scale Structure Formation and Cosmic Microwave Anisotropy in a Cold plus Hot Dark Matter Universe. *Robert K. Schaefer, Quasar Shafi, and Floyd W. Stecker*. 347, 575, 190-D1 (1989)
- SCHATTEN, KENNETH H. Do Faculae Blanket Sunspots? *Kenneth H. Schatten, Jerry Orosz, and Hans G. Mayr*. 347, 514, 188-D1 (1989)
- SCHLEICHER, DAVID G. The Nucleus of Comet P/Tempel 2. *Michael F. A'Hearn, Humberto Campins, David G. Schleicher, and Robert L. Millis*. 347, 1155, 198-A4 (1989)
- SCHMAHL, E. J. The Radio Signatures of a Slow Coronal Mass Ejection: Electron Acceleration at Slow-Mode Shocks? *M. Kundu, N. Gopal-swamy, S. White, P. Cargill, E. J. Schmah, and E. Hildner*. 347, 505, 188-C3 (1989)
- SCHMIDT, EDWARD G. HR Aurigae: An Active Binary? *Charles G. Loomis and Edward G. Schmidt*. 347, L77, 199-D5 (1989)
- SCHMIDT, GARY D. Time-resolved Spectroscopy and Photometry of the Eclipsing AM Herculis Binary EXO 033319 - 2554.2. *Richard G. Allen, Graham Berriman, Paul S. Smith, and Gary D. Schmidt*. 347, 425, 187-D1 (1989)
- SCHNEIDER, P. Energetic Particle Acceleration in Spherically Symmetric Accretion Flows: Importance of a Momentum-dependent Diffusion Coefficient. *P. Schneider and T. J. Bogdan*. 347, 496, 188-B7 (1989)
- SCHRAMM, DAVID N. The Shocking Development of Lithium (and Boron) in Supernovae. *David S. P. Dearborn, David N. Schramm, Gary Steigman, and James Truran*. 347, 455, 187-F5 (1989)
- SCOVILLE, NICK. The Molecular Gas Content of the Nuclear Region of M33. *Christine D. Wilson and Nick Scoville*. 347, 743, 192-E7 (1989)
- SEAB, C. GREGORY. On the Size Distribution of Newly Formed Grains in Red Supergiant Atmospheres. *C. Gregory Seab and Theodore P. Snow*. 347, 479, 188-A3 (1989)
- Predicting Peculiar Interstellar Extinction from Gaseous Abundances: Erratum. *Charles L. Joseph, Theodore P. Snow, Jr., and C. Gregory Seab*. 347, 561, 188-G12 (1989) (Orig. paper in 340, 314, 71-A1)
- SEITZER, PATRICK. The Nonthermal Stellar Dynamics of the Globular Cluster M15. *Ruth C. Peterson, Patrick Seitzer, and Kyle M. Cudworth*. 347, 251, 185-B8 (1989)
- SHAFI, QUAISAR. Large-scale Structure Formation and Cosmic Microwave Anisotropy in a Cold plus Hot Dark Matter Universe. *Robert K. Schaefer, Quasar Shafi, and Floyd W. Stecker*. 347, 575, 190-D1 (1989)
- SHEELEY, N. R., JR. Evolution of the Sun's Polar Fields during Sunspot Cycle 21: Poleward Surges and Long-Term Behavior. *Y.-M. Wang, A. G. Nash, and N. R. Sheeley, Jr.*. 347, 529, 188-E3 (1989)
- SHU, FRANK H. Eccentric Gravitational Instabilities in Nearly Keplerian Disks. *Fred C. Adams, Steven P. Ruden, and Frank H. Shu*. 347, 959, 195-D11 (1989)
- SILVERBERG, R. F. Far-Infrared Spectrophotometry of SN 1987A: Days 265 and 267. *S. H. Moseley, E. Dwek, W. Glaccum, J. R. Graham, R. F. Loewenstein, and R. F. Silverberg*. 347, 1119, 197-E1 (1989)
- SKILLMAN, EVAN D. Oxygen Abundances in Nearby Dwarf Irregular Galaxies. *Evan D. Skillman, R. C. Kennicutt, and P. W. Hodge*. 347, 875, 194-C11 (1989)
- Empirical Oxygen Abundances and Physical Conditions for Relatively Low Abundance H II Regions. *Evan D. Skillman*. 347, 883, 194-D7 (1989)
- SMITH, A. EXOSAT Observations of the Kepler Supernova Remnant. *A. Smith, A. Peacock, M. Arnaud, J. Ballet, R. Rothenflug, and R. Rocchia*. 347, 925, 195-A9 (1989)
- SMITH, HARDING E. Ly $\alpha$  Emission from Disk Absorption Systems at High Redshift: Star Formation in Young Galaxy Disks. *Harding E. Smith, Ross D. Cohen, Joseph E. Burns, David J. Moore, and Barbara A. Uchida*. 347, 87, 183-B11 (1989)
- SMITH, IAN W. M. Effects of Quantum Mechanical Tunneling on Rates of Radiative Association. *Ian W. M. Smith*. 347, 282, 185-E5 (1989)
- SMITH, PAUL S. Time-resolved Spectroscopy and Photometry of the Eclipsing AM Herculis Binary EXO 033319 - 2554.2. *Richard G. Allen, Graham Berriman, Paul S. Smith, and Gary D. Schmidt*. 347, 425, 187-D1 (1989)
- SNEEL, R. L. CO J = 2-1 Observations of the NGC 2071 Molecular Outflow: A Wind-driven Shell. *G. H. Moriarty-Schieven, R. L. Snell, and V. A. Hughes*. 347, 358, 186-E1 (1989)

- SNOW, THEODORE P. On the Size Distribution of Newly Formed Grains in Red Supergiant Atmospheres. *C. Gregory Seab and Theodore P. Snow*. 347, 479, 188-A3 (1989)
- Far-Ultraviolet Spectrophotometry of Spica. *Timothy A. Cook, Webster Cash, and Theodore P. Snow*. 347, L81, 199-D8 (1989)
- SNOW, THEODORE P., JR. Predicting Peculiar Interstellar Extinction from Gaseous Abundances: Erratum. *Charles L. Joseph, Theodore P. Snow, Jr., and C. Gregory Seab*. 347, 561, 188-G12 (1989) (Orig. paper in 340, 314, 71-A1)
- Grain Ultraviolet Extinction Properties of Recently Discovered Post-Asymptotic Giant Branch Stars. *Richard H. Buss, Jr., Henry J. G. L. M. Lamers, and Theodore P. Snow, Jr.* 347, 977, 195-F3 (1989)
- SOIFER, B. T. Continuum Energy Distributions of Quasars: Shapes and Origins. *D. B. Sanders, E. S. Phinney, G. Neugebauer, B. T. Soifer, and K. Matthews*. 347, 29, 182-D7 (1989)
- SPARKS, WILLIAM B. Polarization and Visual Intensity of the Inner Light Echo around SN 1987A. *William B. Sparks, Francesco Paresce, and Duccio Macchetto*. 347, L65, 199-C2 (1989)
- SPIEGEL, DAVID N. Dynamical Evolution of Domain Walls in an Expanding Universe. *William H. Press, Barbara S. Ryden, and David N. Spiegel*. 347, 590, 190-E3 (1989)
- ST.-LOUIS, NICOLE. Polarization Variability among Wolf-Rayet Stars. V. Linear Polarization of the Bright Cygnus Stars and an Anticorrelation of Variability with Wind Speed. *Carmelle Robert, Anthony F. J. Moffat, Pierre Bastien, Laurent Drissen, and Nicole St.-Louis*. 347, 1034, 196-D5 (1989)
- STAHLER, STEVEN W. Luminosity Jumps in Pre-Main-Sequence Stars. *Steven W. Stahl*. 347, 950, 195-C13 (1989)
- STECKER, FLOYD W. Large-scale Structure Formation and Cosmic Microwave Anisotropy in a Cold plus Hot Dark Matter Universe. *Robert K. Schaefer, Quasar Shaf, and Floyd W. Stecker*. 347, 575, 190-D1 (1989)
- STEIDEL, CHARLES C. A High-Redshift Extension of the Survey for C IV Absorption in the Spectra of QSOs: The Redshift Evolution of the Heavy Element Absorbers (Abstract of Paper in 1990 January Suppl.). *Charles C. Steidel*. 347, 1187, 198-E1 (1989)
- STEIGMAN, GARY. The Shocking Development of Lithium (and Boron) in Supernovae. *David S. P. Dearborn, David N. Schramm, Gary Steigman, and James Truran*. 347, 455, 187-F5 (1989)
- STERNBERG, AMIEL. Ultraviolet Fluorescent Molecular Hydrogen Emission. *Amiel Sternberg*. 347, 863, 194-B5 (1989)
- STRASSMEIER, KLAUS G. Chromospheric Ca II H and K and H $\alpha$  Emission in Single and Binary Stars of Spectral Types F6-M2 (Abstract of Paper in 1990 January Suppl.). *Klaus G. Strassmeier, Francis C. Fekel, Bernard W. Bopp, Robert C. Dempsey, and George W. Henry*. 347, 1189, 198-E3 (1989)
- STRICKLAND, D. J. The Ultraviolet Variability of HD 45166 (qWR + B8 V): Evidence for Stellar Wind Radiative Instabilities. *Allan J. Willis, Ian D. Howarth, D. J. Strickland, and S. R. Heap*. 347, 413, 187-C1 (1989)
- SUBRAHMANYAN, R. On the Origin of the Diffuse X-Ray Background. *R. Subrahmanyan and R. Cowick*. 347, 1, 182-B1 (1989)
- SUZUKI, HIROKO. A New CO Bipolar Flow and Dense Disk System Associated with the Infrared Reflection Nebula GGD 27 IRS. *Takuya Yamashita, Hiroko Suzuki, Norio Kaifu, Motohide Tamura, Charles M. Mountain, and Toby J. T. Moore*. 347, 894, 194-E7 (1989)
- TAMURA, MOTOHIDE. A New CO Bipolar Flow and Dense Disk System Associated with the Infrared Reflection Nebula GGD 27 IRS. *Takuya Yamashita, Hiroko Suzuki, Norio Kaifu, Motohide Tamura, Charles M. Mountain, and Toby J. T. Moore*. 347, 894, 194-E7 (1989)
- TANAKA, Y. X-Ray Outburst of the quasar 3C 279. *F. Makino, T. Kii, K. Hayashida, H. Inoue, Y. Tanaka, T. Ohashi, K. Makishima, H. Awaki, K. Koyama, M. J. L. Turner, and O. R. Williams*. 347, L9, 189-B9 (1989)
- TANDON, S. N. Far-Infrared and Radio Observations of the W31 Star-forming Region. *S. K. Ghosh, K. V. K. Iyengar, T. N. Rengarajan, S. N. Tandon, R. P. Verma, R. Daniel, and Paul T. P. Ho*. 347, 338, 186-C3 (1989)
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- TAYLOR, J. H. Evidence for Geodetic Spin Precession in the Binary Pulsar PSR 1913 + 16. *J. M. Weisberg, R. W. Romani, and J. H. Taylor*. 347, 1030, 196-C13 (1989)
- TEREBEY, S. Radio Continuum Observations of IRAS Sources Associated with Dense Cores. *L. F. Rodriguez, P. C. Myers, I. Cruz-González, and S. Terebey*. 347, 461, 187-F11 (1989)
- THADDEUS, P. CO Observations of the Cepheus Flare. I. Molecular Clouds Associated with a Nearby Bubble. *I. A. Grenier, F. Lebrun, M. Arnaud, T. M. Dame, and P. Thaddeus*. 347, 231, 185-A1 (1989)
- THOMSEN, BJARNE. Magnesium Gradients in Elliptical Galaxies. III. Results and Interpretation. *Bjarne Thomsen and William A. Baum*. 347, 214, 184-F8 (1989)
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- TRINCHIERI, G. Radio Emission and the Hot Interstellar Medium of Early-Type Galaxies. *G. Fabbiano, I. M. Gioia, and G. Trinchieri*. 347, 127, 182-F3 (1989)
- TROLAND, T. H. Structure of the Magnetic Field in the W3 Core. *T. H. Troland, R. M. Crutcher, W. M. Goss, and C. Heiles*. 347, L89, 199-E5 (1989)
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- TURATTO, MASSIMO. Padova 1: A Heavily Obscured Seyfert Galaxy in Aquila. *Franco Sabbadin, Enrico Cappellaro, Luciano Salvadori, and Massimo Turatto*. 347, L5, 189-B5 (1989)
- TURNER, B. E. Detection of Interstellar C<sub>2</sub>D: Implications for Ion-Molecule Chemistry. *B. E. Turner*. 347, L39, 189-E5 (1989)
- TURNER, M. J. L. X-Ray Outburst of the quasar 3C 279. *F. Makino, T. Kii, K. Hayashida, H. Inoue, Y. Tanaka, T. Ohashi, K. Makishima, H. Awaki, K. Koyama, M. J. L. Turner, and O. R. Williams*. 347, L9, 189-B9 (1989)
- UCHIDA, BARBARA A. Ly $\alpha$  Emission from Disk Absorption Systems at High Redshift: Star Formation in Young Galaxy Disks. *Harding E. Smith, Ross D. Cohen, Joseph E. Burns, David J. Moore, and Barbara A. Uchida*. 347, 87, 183-B11 (1989)
- UKITA, NOBUHARU. The Inner, Dense Part of the Protostellar Disk: A CS J = 7-6 Observation around NGC 2071 IRS. *Takuya Yamashita, Saeko S. Hayashi, Norio Kaifu, Osamu Kameya, Nobuharu Ukita, and Tetsuo Hasegawa*. 347, L85, 199-E1 (1989)
- VAN DEN BERGH, SIDNEY. The Intrinsic Frequency of Faint Supernovae Resembling SN 1987A. *Sidney van den Bergh and R. D. McClure*. 347, L29, 189-D7 (1989)
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- VISHNIAC, ETHAN T. A Self-consistent Model of Mass and Angular Momentum Transport in Accretion Disks. *Ethan T. Vishniac and Patrick Diamond*. 347, 435, 187-D11 (1989)
- An Axisymmetric, Nonstationary Model of the Central Engine in an Active Galactic Nucleus. II. Accretion Disk Electrodynamics. *Seok Jae Park and Ethan T. Vishniac*. 347, 684, 191-F9 (1989)
- VÖLKENING, J. Iron Isotope Anomalies. *J. Völkening and D. A. Papanastassiou*. 347, L43, 189-E10 (1989)
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- WANG, Y.-M. Evolution of the Sun's Polar Fields during Sunspot Cycle 21: Poleward Surges and Long-Term Behavior. *Y.-M. Wang, A. G. Nash, and N. R. Sheeley, Jr.* 347, 529, 188-E3 (1989)
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- WARDLE, J. F. C. The Milliarcsecond Polarization Structure of Six BL Lacertae Objects. *D. C. Gabuzda, T. V. Cawthorne, D. H. Roberts, and J. F. C. Wardle*. 347, 701, 192-A5 (1989)
- WATSON, J. K. G. Laboratory Observation of the  $2p_2$  Band of the H $_2^+$  Molecular Ion. *W. A. Majewski, P. A. Feldman, and J. K. G. Watson*. 347, L51, 189-F5 (1989)
- WEISBERG, J. M. Evidence for Geodetic Spin Precession in the Binary Pulsar PSR 1913 + 16. *J. M. Weisberg, R. W. Romani, and J. H. Taylor*. 347, 1030, 196-C13 (1989)
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- WHITE, SIMON D. M. Superclustering of Quasi-stellar Object Absorption Clouds. *Julia Heisler, Craig J. Hogan, and Simon D. M. White*. 347, 52, 182-F7 (1989)



- WILLIAMS, O. R. X-Ray Outburst of the quasar 3C 279. *F. Makino, T. Kii, K. Hayashida, H. Inoue, Y. Tanaka, T. Ohashi, K. Makishima, H. Awaki, K. Koyama, M. J. L. Turner, and O. R. Williams.* **347**, L9, 189-B9 (1989)
- WILLIS, ALLAN J. The Ultraviolet Variability of HD 45166 (qWR + B8 V): Evidence for Stellar Wind Radiative Instabilities. *Allan J. Willis, Ian D. Howarth, D. J. Strickland, and S. R. Heap.* **347**, 413, 187-C1 (1989)
- WILSON, CHRISTINE D. The Molecular Gas Content of the Nuclear Region of M33. *Christine D. Wilson and Nick Scoville.* **347**, 743, 192-E7 (1989)
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- WINKLER, P. FRANK. An Atlas of Confirmed and Candidate Supernova Remnants in M33 (Abstract of Paper in 1990 January Suppl.). *Knox S. Long, William P. Blair, Robert P. Kirshner, and P. Frank Winkler.* **347**, 1188, 198-E2 (1989)
- WITT, ADOLF N. The Extended Red Emission Filaments in NGC 2023. *Adolf N. Witt and David F. Malin.* **347**, L25, 189-D1 (1989)
- WOODARD, MARTIN F. Distortion of High-Degree Solar  $p$ -Mode Eigenfunctions by Latitudinal Differential Rotation. *Martin F. Woodard.* **347**, 1176, 198-C3 (1989)
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- The Inner, Dense Part of the Protostellar Disk: A CS  $J = 7-6$  Observation around NGC 2071 IRS. *Takuya Yamashita, Saeko S. Hayashi, Norio Kaifu, Osamu Kameya, Nobuharu Ukita, and Tetsuo Hasegawa.* **347**, L85, 199-E1 (1989)
- YORK, DONALD G. Absorption Lines at  $z > 2.3$  in Spectra of Quasistellar Objects. *Pushpa Khare, Donald G. York, and Richard Green.* **347**, 627, 191-A7 (1989)
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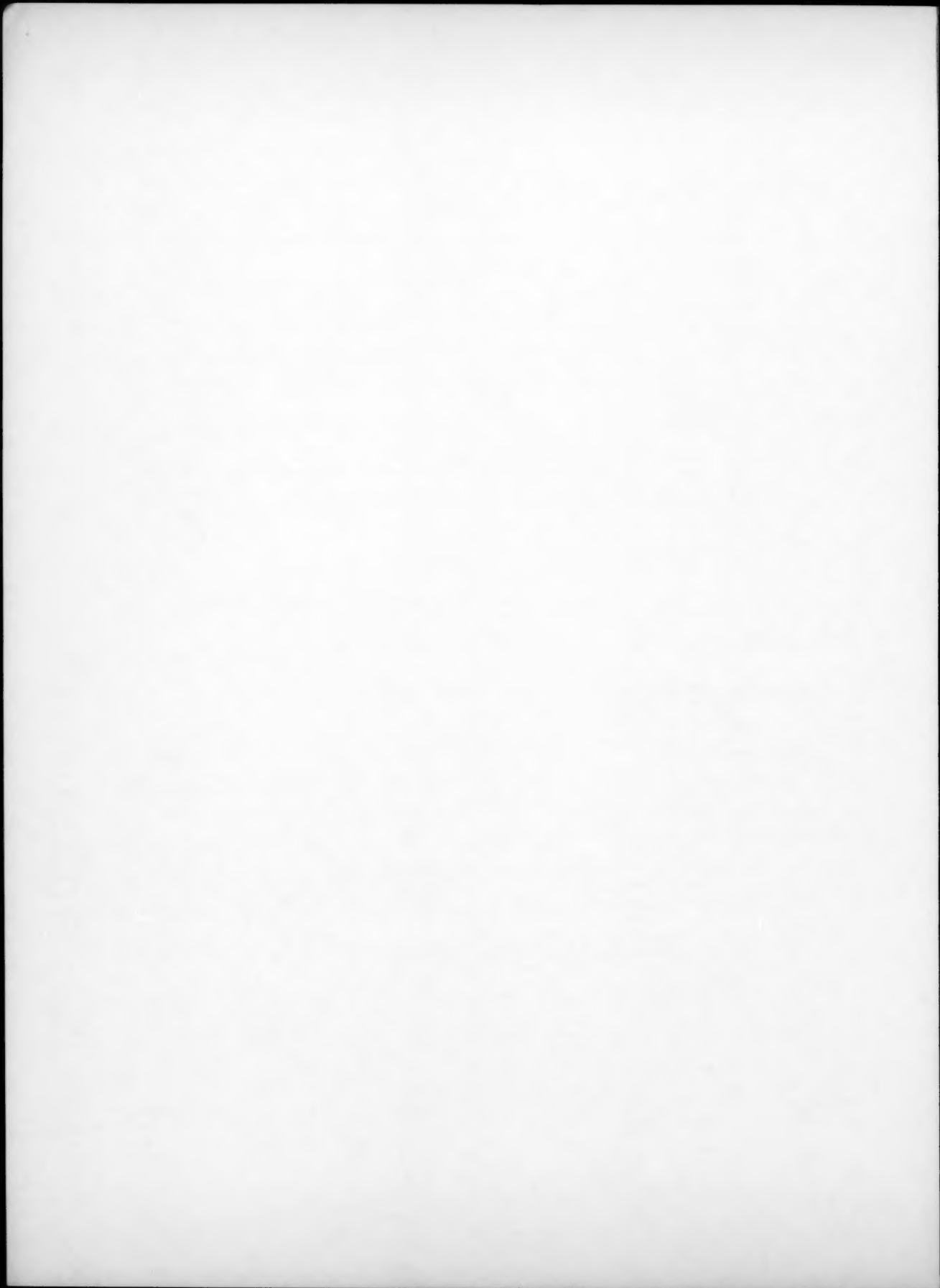


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